TECHNICAL NOTES:

SAFETY DEVICES FOR HYDRAULIC SOIL CORING MACHINES

J. K. Aase, J. L. Pikul, Jr., L. L. Reitz

ABSTRACT. *There are inherent safety hazards associated with the operation of commercially available hydraulic soil coring machines. Objectives were to improve safety of hydraulic soil coring machine operations without employing cumbersome devices that are likely to be discarded by machine operators. Serious finger injuries can occur if the rotary hydraulic controls are accidentally engaged while the soil sampling tube is pressed into or extracted from the soil. Heavy down pressures while pushing the soil tube through dense soil layers may cause the hinge lock to slip out of the locked position, resulting in a bent cylinder rod and posing a safety hazard when repositioning the hinge lock. Cleaning the soil tube with a hydraulically driven rotary brush has caused finger injuries because it is very difficult to apply enough bare-hand pressure to keep the brush from turning the tube. To eliminate the potential of accidentally engaging the rotary hydraulic controls, a swing-out safety plate was added to the rotary control lever. A stop plate was added to prevent the hinge lock from slipping. A protective sleeve was provided to prevent finger injuries while holding and cleaning soil tubes. These safety devices are simple to install and easy to use, thereby enhancing safe operation of the machine.*
Keywords. *Equipment, Soil sampling.*

Hydraulic soil coring machines have been used to sample a wide range of soils. Sampling on glacial till soils poses a unique challenge to operators and equipment. Pockets of sand, gravel, and clay, and numerous rocks create a difficult sampling task. Equipment is often stressed when attempting to break through impeding layers to complete the sampling task. Frequent use is made of rotary augers and tip cleaning brushes. After some finger injuries and near irreparable damage to machine parts, it has become apparent that some safety features would be most advantageous. Our objectives were to improve the safety of hydraulic soil coring operations without employing cumbersome devices that would be discarded by machine operators.

SAFETY DEVICES

The safety devices we refer to were developed for a Giddings Machine Company coring machine model HD-GSRP-S, but the principles of the devices described will apply to other similar brands of machines.

While operating the machine and concentrating on either pushing the soil sampling tube into the ground or pulling it back out, it is easy to grab and engage the rotary control handle rather than the master cylinder control handle. Such a mistake can injure an operator and damage equipment. Should the rotary handle be engaged erroneously, injuries to the fingers and/or hand can occur when the tube rotates unexpectedly. If the rotary control is

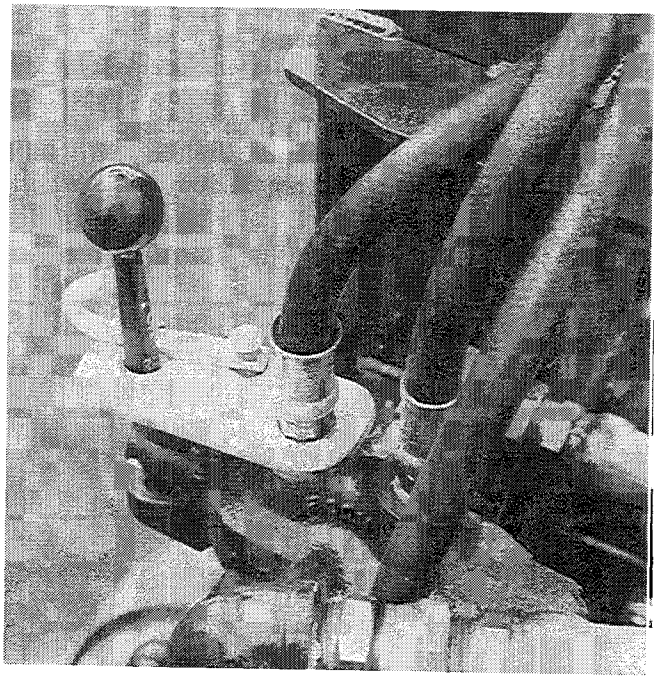

Figure 1–Spring loaded latch holding rotary lever in place.

Article was submitted for publication in August 1992; reviewed and approved for publication by the Power and Machinery Div. of ASAE in April 1993.

Contribution from the USDA-Agricultural Research Service in cooperation with Montana Agricultural Experiment Station, Journal Series No. J2829.

The authors are **J. Kristian Aase**, Soil Scientist, **Joseph L. Pikul, Jr.**, Soil Scientist, and **Larry L. Reitz**, Agricultural Research Technician, USDA-Agricultural Research Service, Northern Plains Soil and Water Research Laboratory, Sidney, MT.

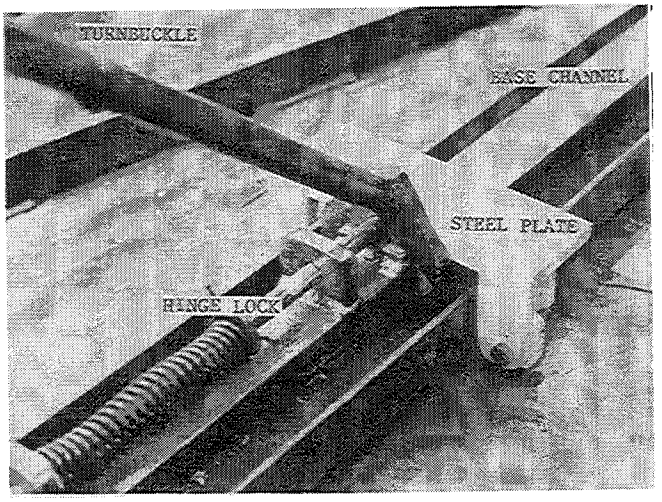

Figure 2–Safety plate placed over base channel and behind turnbuckle.

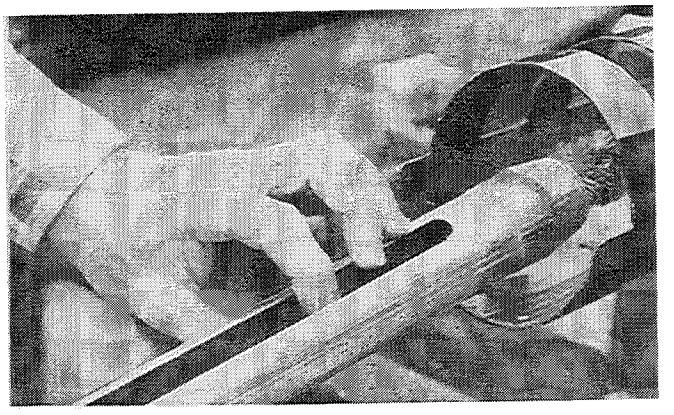

Figure 3–Illustration of potential safety hazard to fingers while cleaning soil tube.

mistakenly engaged while the soil tube is in the soil, the sampling tube is easily twisted and ruined.

The simplest safety feature added was to paint identifying lettering on support braces adjacent to each of the four control levers. To prevent accidental engagement of the rotary control lever, a swing-out safety plate was constructed and attached to the base of the rotary control lever. The plate is held in place by a spring-loaded latch which must be released before the plate can be swung free for the rotary lever to be engaged (fig. 1).

Under difficult sampling conditions, such as on sloping land or on glacial till soils, strain is commonly put on the mast, causing "back" pressure on the hinge lock, turnbuckle, and laydown cylinder. Under such conditions the lay-down cylinder tends to bend, with the potential of causing irreparable damage to the cylinder. The hinge lock can also slip out of position causing difficult problems in correcting mast position. To remedy these problems a steel plate was placed behind the turnbuckle. The plate was formed from 76- × 76- × 13-mm (3- × 3- × 0.5-in.) thick angle iron with "wings" cut out from one side such that the "wings", when the plate was put on top of the base channel, fit along the sides of the channel and seated in front of L-shaped brackets welded on to each side of the base channel. The brackets were made from the same stock as the plate. Ten-millimeter (3/8-in.) holes were drilled through the "wings" and brackets, and bolts were passed through the holes. One bolt is used as a hinge and the other to lock the plate in place while the machine is in operation (fig. 2).

When using the hydraulic rotary tube-brush to clean slotted soil tubes, serious finger injury can occur. The brush provides enough friction to easily turn the tube and bare fingers can become caught in the slot (fig. 3). Heavy gloves may be worn while cleaning the tubes, but that tends to be inconvenient while working with soil samples.

To provide safe operation of the rotary tube-brush, we inserted the soil tube in a 700-mm (28-in.) long section of standard 64-mm (2.5-in.) diameter, cotton-jacketed fire hose. The interior rubber coating of the fire hose provides enough friction so that the operator can easily control the soil tube with both hands while totally protecting fingers from injury. The fire hose works well with a standard 45-mm (1.75-in.) soil tube. The hose section conveniently fits in the tube guide for storage.

The foregoing simple safety provisions on the hydraulic soil coring machine have increased the safe operation of the machine. The safety devices are convenient and simple and therefore are used by machine operators. Although specific items may differ in form and content, similar ideas and devices may be applied to other brands of hydraulic or mechanical sampling devices.